BIOLOGICAL OPINION
ROUTE 161 RECONSTRUCTION AND WIDENING PROJECT
CROSS LAKE, T17 R4, AROOSTOOK COUNTY, MAINE
U.S. FISH AND WILDLIFE SERVICE
MAINE FIELD OFFICE
OLD TOWN, MAINE

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Introduction and Consultation History

This document is the U. S. Fish and Wildlife Service's (Service) Biological Opinion (Opinion) based on our review of the proposed Route 161 reconstruction and widening project in Cross Lake (formerly T17 R5), Aroostook County, Maine (PIN 10005.00) STP-1000(500)X and its effects on Canada lynx (*Lynx canadensis*) in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended. The Federal Highway Administration's (FHWA) December 5, 2006 request for formal consultation was received on December 12, 2006. The Opinion is based on information provided by Maine Department of Transportation (MaineDOT) and the FHWA in a Biological Assessment accompanying the December 5, 2006 letter.

Informal consultation on this proposed action between the Service and MaineDOT began on July 21, 2006. FHWA has delegated informal Section 7 consultation to MaineDOT. MaineDOT and FHWA's original determination was that this project was not likely to adversely affect the species and unlikely to adversely modify the proposed critical habitat. The Service and MaineDOT reviewed the project and its anticipated effects on lynx at a subsequent informal Section 7 consultation meeting on September 28, 2006 where it was determined that this project was likely to adversely affect Canada lynx, but would not adversely modify critical habitat if it were designated. Since that finding was made, on November 9, 2006 the Service determined that there would be no habitat designated as critical habitat in Maine (FR 71 No. 217:66008-66061). A draft biological opinion was submitted to the MaineDOT for review on February 7, 2007 and FHWA on February 13, 2007.

Section 7(a)(2) of the ESA requires federal agencies to consult with the Service to ensure that any action authorized, funded, or carried out is not likely to jeopardize the continued existence of any federally listed species nor destroy or adversely modify critical habitat. The Service and the federal agency or its designated representative implement section 7 of the ESA by consulting or conferring on any federal action that may affect federally listed or proposed threatened and endangered species and/or designated or proposed critical habitat.

This Biological Opinion is based on the best available scientific and commercial data including electronic mail and telephone correspondence with MaineDOT and FHWA officials, Service files, pertinent scientific literature, discussions with recognized species authorities, and other scientific sources. A complete administrative record of this consultation is on file in the Maine Ecological Services Field Office in Old Town, Maine.

Concurrence

During informal consultation, MaineDOT and the Service concluded the proposed action may affect and is likely to adversely affect the Canada lynx. The Service requested FHWA initiate formal consultation. FHWA concurred with the informal finding and initiated formal consultation on December 5, 2006. MaineDOT and FHWA concluded that the proposed action may affect and is likely to adversely affect Canada lynx and that there would be no effect on bald eagles. They also concluded that critical habitat for the

Canada lynx would not be affected (because there was no critical habitat designated in Maine). The Service concurred with these determinations.

BIOLOGICAL OPINION

1. Description of the Proposed Action

In its Biological Assessment, MaineDOT and FHWA describe the project to reconstruct Route 161 in Cross Lake Township (formerly T17 R5 WELS) in Aroostook County, Maine. The project will resurface and widen Route 161 from 0.57 miles north of the T17 R4 town line northwest 5.23 miles to a point 0.31 miles north of the Ouellette Road. Route 161 formed a portion of the northeast boundary of the proposed critical habitat for the Canada lynx.

The southern two-thirds of the project (approximately 3 miles) is located within 1/2 mile of Cross Lake. This area is predominantly forested with a utility corridor running parallel and adjacent to the northeastern edge of the road for 1.4 miles. The utility corridor increases the width of the non-forested corridor along this portion of the road to approximately 150 feet. Surrounding land use is primarily mixed and coniferous forest. The northern 1.5 miles of the project is composed of open agricultural fields.

This project will expand the travel lanes from 11 to 12 feet, the road shoulder will be increased from 3 to 8 feet, and the slopes will be changed from 3:1 to 4:1. Five feet of the shoulder will be paved and the remaining 3 feet will be left as gravel. The current combined travel lane and shoulder width is approximately 14 feet (11 feet + 3 feet). The proposed widening of both the travel lane and shoulder will increase the combined width to approximately 20 feet (12 feet + 8 feet). The current road footprint, including paved travel lanes, gravel shoulders, inslopes and cleared backslopes is approximately 66 feet wide.

This project is anticipated to increase traffic volume and speed. Route 161 is described as a low volume highway, which currently receives an average daily traffic of 1,540 vehicles/day, which is forecasted to increase to1,720 vehicles/day in 2018 and 1,850 vehicles/day in 2026. The posted speed limit along Route 161 is 50 mph, which is in place because of the poor quality of the road. Once the road repairs are made, the speed limit will increase to 55 mph to make it consistent with the remainder of the travel corridor and design guidelines. Route 161 is straight throughout the project area with few intersections, curves, or residential areas.

2. Status of the Canada lynx

In 2000, the lynx was listed as threatened (65 FR 16052); a clarification to the findings in support of the final listing rule was published in the Federal Register on July 3, 2003 (68 FR 40076) and January 10, 2007 (72 FR 1186-1189). The lynx is currently listed as threatened in the contiguous Unites States as a Distinct Population Segment (DPS) that includes the States of Colorado, Idaho, Maine, Michigan, Minnesota, Montana, New

Hampshire, New York, Oregon, Utah, Vermont, Washington, Wisconsin, and Wyoming. In the contiguous United States, the majority of lynx habitat and lynx exist on Federal lands in western states and on private lands in the Northeast. Critical habitat designation was proposed by the Service for the lynx in 2005 (70 FR 68294), including large portions of northwestern Maine. The final rule, published November 9, 2006 (71 FR, 66008-66061), designated no critical habitat in Maine.

Reasons for listing in the final rule and rule clarification (65 FR. 16052 and 68 FR 40076, respectively) are: the inadequacy of existing regulatory mechanisms, specifically the lack of conservation planning on Federal lands to ensure viable lynx populations; effects of forest harvest, management and fire suppression; lack of a cohesive international strategy to ensure habitat connectivity with core lynx populations in Canada; high traffic volume roads and suburban development; and “take”, as defined by the ESA, from incidental catch by trapping, snaring and hunting.

2.1.1. Species Description

Lynx are medium-sized cats, generally measuring 75 to 90 centimeters (cm) long (30 to 35 inches (in)) and weighing 8 to10.5 kilograms (18 to 23 pounds) (Quinn and Parker 1987). They have large, well-furred feet and long legs for traversing snow; tufts on the ears; and short, black-tipped tails. Lynx are a territorial and wide-ranging species requiring relatively large, undisturbed boreal forest with a sufficient prey-base to maintain healthy, viable populations. Lynx are associated with early successional boreal forest where their primary prey, the snowshoe hare, is abundant. Their specialized adaptations to deep, fluffy snow, gives them an advantage over potential competitors and enables them to be efficient predators of their primary prey.

2.1.2. Life History

Threats

The reasons for listing the lynx as threatened are described in the final listing rule published in the Federal Register on March 24, 2000 (65 FR 16052) and the clarification of findings published in the Federal Register on July 3, 2003 (68 FR 40076).

Presently within the contiguous United States, human alteration of forest distribution, abundance, species composition, successional stages, structure and connectivity plays a dominant role in affecting the boreal forest landscape’s capacity to sustain lynx populations. Timber harvest and its related activities are the predominant land uses affecting lynx habitat in the contiguous United States. Timber harvest and associated forest management can be benign, beneficial, or detrimental to lynx depending on harvest methods, spatial and temporal specifications, and the forest ecology of the site.

Forestry practices can be beneficial for lynx when the resulting understory stem densities and structure meet the forage and cover needs of snowshoe hare (Wolff 1980; Litvaitis et al. 1985; Monthey 1986; Koehler 1990; Hoving et al. 2004; Vashon et al. 2005a). Although areas that are cut initially may not be used by snowshoe hare and lynx, regeneration from some forms of silviculture (e.g., clear-cuts or other even-aged management) in appropriate habitat types can grow (in 10 years or more depending on local conditions) to become stands with dense understories preferred by snowshoe hares and, therefore, lynx (Monthey 1986; Koehler 1990; Koehler and Brittell 1990; Ruediger et al. 2000; Homyack 2003; Hoving et al. 2004; Vashon et al. 2005a). For example, in Maine, forest regeneration after extensive clearcutting that occurred 10 to 25 years ago is providing high quality hare habitat over extensive landscapes and, thus, is sustaining the lynx population (Vashon et al. 2005a, Homyack 2003, Robinson 2006).

Some timber harvest regimes can result in forest openings and large monotypic stands with sparse understories that are unfavorable for lynx and snowshoe hare (Koehler 1990; Homyack 2003; Hoving et al. 2004, Robinson 2006). In Maine, pre-commercial thinning (mechanized or herbicide treatments) to promote vigorous growth of fewer trees diminishes the understory and horizontal cover preferred by snowshoe hares (Homyack et al. 2004). In these instances, pre-commercially thinned stands support lower snowshoe hares densities than un-thinned stands (Ruediger et al. 2000; Homyack 2003; Griffin 2004).

Fire is important in creating the mosaic of differing forest stand ages and structures in some boreal forest types used by lynx. Fire suppression policies likely have had little overall impact to lynx habitat because most forests where lynx habitat occurs have natural fire return intervals that are longer than the period of time that has elapsed since the inception of these policies. In addition, fires that occur in lynx habitat are often large, high-intensity fires that are difficult to suppress, regardless of management objectives. Reducing fuel loads to reduce the risk of fire (U.S. Department of Agriculture and U.S. Department of the Interior 2001) can diminish the value of lynx habitat by clearing understory vegetation that is an important component of snowshoe hare habitat.

An unresolved theory is whether packed snow trails, such as from snowmobiles or skis, facilitate the access of potential lynx competitors (e.g., coyote) into winter lynx habitats that are otherwise inaccessible, enabling them to effectively compete with lynx (Buskirk 2000a). Within lynx home ranges in northwest Montana, coyotes made limited use of compacted snowmobile trails for travel and primarily scavenged for food; snowshoe hare kills made up 3 percent of coyote kill sites (Kolbe 2005). In potential lynx habitats, Bunnell (2005) found that coyotes require packed snow trails to access deep snow habitats in mountain ranges in Utah, eastern Idaho, and northern Wyoming. Thus, the threat of increased competition for food or interference between species due to increases in packed snow trails remains hypothetical.

A substantial amount of lynx habitat in the contiguous United States is found on Federal lands, primarily National Forest lands. At the time of the final listing rule, the U. S. Fish and Wildlife Service found that federal land management plans did not adequately address risks to lynx and allowed actions that cumulatively could result in significant detrimental effects to lynx in the contiguous United States. As a result, the Service concluded in the final rule that the lack of Federal land management plan guidance for conservation of lynx, and the potential for plans to allow or direct actions that adversely affect lynx, were a significant threat to the contiguous United States lynx population. Currently, numerous U.S. Forest Service (USFS) and Bureau of Land Management (BLM) Plans are in the process of revision or amendment (e.g., USFS 2004) by incorporating the Lynx Conservation Assessment and Strategy (LCAS)(Ruediger et al. 2000). The LCAS is a multi-agency strategy that uses the best scientific information available to provide a consistent and effective approach to conserve lynx on federal lands (Ruediger et al. 2000).

Scientific evidence has demonstrated that globally the climate has been warming as evidenced by changes in the amount of snow cover, among other indicators (Intergovernmental Panel on Climate Change 2001). Continued warming temperatures are likely to negatively affect the cold climatic conditions that create and maintain the boreal forest ecosystem for which lynx are highly adapted. As a result, models predict that continued warming trends may eventually cause some of the boreal forest vegetation types to recede north and/or recede to higher elevations (Hansen et al. 2001) or to affect snow depths, which could affect lynx distribution (Hoving 2001).

Snowshoe hare density, more than any other factor is the most important factor explaining the persistence of lynx populations (Steury and Murray 2004). A minimum average landscape density of snowshoe hares necessary to maintain a persistent, reproducing lynx population within the contiguous United States has not been determined, although Ruggiero et al. (2000) suggested that at least 0.5 hares per ha (1.2 hares per ac) may be necessary. Steury and Murray (2004) modeled lynx and snowshoe hare populations and predicted that a minimum of 1.1 to 1.8 hares per ha (2.7 to 4.4 hares per ac) was required for persistence of a reintroduced lynx population in the southern portion of the lynx range.

Habitats supporting abundant snowshoe hares must be present in a large proportion of the landscape to support a viable lynx population. The boreal forest landscape must contain a mosaic of forest successional stages to sustain lynx populations over the long term as the condition of individual stands changes over time. If the vegetation potential of a particular forest stand is conducive to supporting abundant snowshoe hares, it likely will also go through successional phases that are unsuitable as lynx foraging (snowshoe hare habitat) or lynx denning habitat (Agee 2000; Buskirk et al. 2000b). For example, a boreal forest stand where there has been recent disturbance, such as fire or timber harvest, resulting in little or no understory structure is unsuitable as snowhoe hare habitat for lynx foraging. That temporarily unsuitable stand may regenerate into suitable snowshoe hare (lynx foraging) habitat within 10 to 25 years, depending on local conditions (Ruediger et al. 2000). Stands may continue to provide suitable snowshoe hare habitat for many years until woody stems in the understory become too sparse, as a result of undisturbed forest succession or management (e.g., clearcutting or thinning). Ruediger et al. (2000) and Hoving et al. (2004) hypothesize that forest management techniques that thin the understory may render the habitat unsuitable for hares and, thus, for lynx. However, research on the effects of pre-commercially thinned stands on lynx habitat use, fitness, or movements has not been done.

As described previously, snowshoe hares prefer boreal forest stands that have a dense horizontal understory to provide food, cover and security from predators. Snowshoe hares feed on conifers, deciduous trees and shrubs (Hodges 2000b). Snowshoe hare density is correlated to understory cover between approximately 1 to 3 m (3 to 10 ft) above the ground or snow level (Hodges 2000b). Habitats most heavily used by snowshoe hares are stands with shrubs, stands that are densely stocked, and stands at ages where branches provide more lateral cover (Hodges 2000b). Generally, earlier successional forest stages support a greater density of horizontal structure (stem density, stem cover units) in the understory and more abundant snowshoe hares (Buehler and Keith 1982; Wolfe et al. 1982; Koehler 1990; Hodges 2000b; Homyack 2003; Griffin 2004, Robinson 2006); however, sometimes mature stands also can have adequate dense understory to support abundant snowshoe hares (Griffin 2004).

In Maine, the highest snowshoe hare densities are found in regenerating softwood (spruce and fir) and mixedwood (softwood predominant) stands (Homyack 2003, Fuller and Harrison 2005, Robinson 2006). In the north Cascades, the highest snowshoe hare densities were found in 20-year-old lodgepole pine stands with a dense understory (Koehler 1990). In montane and subalpine forests in northwest Montana, the highest snowshoe hare densities in summer were generally in younger stands with dense forest structure, whereas in winter snowshoe hare densities were as high or higher in mature, multi-story stands with dense understory forest structure (Griffin 2004).

Habitat for lynx den sites does not seem to be limiting. Den sites are found in mature and younger boreal forest stands that have a large amount of cover and downed, large woody debris (Mowat et al. 2000). The structural components of lynx den sites are common features in managed (logged) and unmanaged (e.g., insect damage, ice damage, and wind-throw) stands. Downed trees provide excellent cover for den sites and kittens and often are associated with dense woody stem growth.

There is little published information concerning lynx response to human-related development and activities as most lynx research has been done in remote locations. Lynx (in contrast to bobcats, coyotes, and fishers) are not known to regularly occupy moderately-developed landscapes in North America even when appropriate habitat exists (Ruggiero et al. 2000). In Minnesota, lynx have been observed, captured, and radio-tagged in lightly developed rural areas on private land within the Superior National Forest (Burdette, Univ. of Minnesota, unpub. data). Lynx are described as being tolerant of humans (Staples 1995), and anecdotes suggest that lynx are not displaced by human presence, including moderate levels of snowmobile traffic (Mowat et al. 2000) and ski area activity (Roe et al. 1999).

Other reasons for listing as discussed by the Service includes: lack of an international conservation strategy to maintain habitat connectivity between lynx metapopulations of Canada and the United States; incidental take of lynx associated with trapping, snaring, or hunting; and potential deleterious effects of high traffic volume roads.

2.1.3 Status and Distribution

Status in Maine

Maine's lynx population is contiguous with populations south of the St. Lawrence River (southern Quebec, Gaspe Peninsula, and northern New Brunswick). A population of lynx has persisted in Maine during historic times. An historic review by Hoving et al. (2003) documented 188 records between 1833-1999 including records of 39 kittens from a minimum of 21 litters, indicating a long-term breeding presence in the state. Historically, lynx ranged statewide, but their range contracted in the 1900s primarily to the western and northern parts of the state. Range contraction is believed to be caused by changing habitat, climate, and carnivore community (particularly the northward expansion of bobcat populations) (Hoving et al. 2003).

Historic data suggested lynx populations fluctuated widely. For example, during the Civil War (1864-65) a Maine fur dealer (Hardy 1907a,b), purchased “several hundred” pelts annually, followed by a few years with no skins, then several years of 200 lynx hides. At least 30 lynx were bountied from 1833-1967, when a bounty was in effect. The lynx was proposed for state-threatened status in 1987. The Maine Department of Inland Fisheries and Wildlife (MDIFW) classified lynx as a furbearer with no open season during 1963 and a species of Special Concern during 1997. In northern Canada and Alaska, lynx populations cycle in response to the 10-year snowshoe hare cycle. Hare populations in Maine do not seem to be cycling and seem to be remaining at high population levels (D. Harrison and W. Krohn, UMaine, unpub. data). Although no reliable population estimates exist, current habitat assessments (Hoving 2001), population densities from a lynx telemetry study (J. Vashon, MDIFW, unpub. data), and results of snow track surveys suggests that 500 or more animals could occur statewide. These data suggest that lynx are currently more abundant than at any other time in recent decades.

Today, lynx are most frequently encountered in areas north of Greenville, Millinocket, and Houlton, but individuals may be occasionally observed throughout much of northern, western, and eastern Maine. From 2003-06, MDIFW and Service surveyed approximately 60 townships (or 1.2 million acres) throughout the lynx range in northern Maine to better document the distribution and collect data for new habitat models. The population seems to be well distributed throughout this area. In optimal habitat on the Gaspe Peninsula, fall lynx densities (adults and kittens) are estimated to be 10 lynx/100 km^2 (or about 20,000 acres or one township). Lynx densities on the Musquacook Lake study area in Maine are estimated to be about 15 lynx/100km^2 in high quality habitat (J. Vashon, MDIFW, unpub. data).

Research in northwestern Maine documented high productivity of lynx; 91% percent (30 of 33 potential litters) of available adult females (greater than 2 years-old) produced litters, and litters averaged 2.83 kittens (Vashon et al. 2005b). Snowshoe hare are at high densities in many areas in northern Maine, lynx home range sizes are small, and productivity is high, and mortality is low. These patterns indicates that Maine’s lynx population is healthy and likely increasing. Current and future habitat conditions for lynx are being modeled by the University of Maine and Maine Cooperative Fish and Wildlife Research Unit through several graduate student projects.

Maine-based studies indicate lynx chose dens in regenerating hardwoods and softwoods, with a dense understory and abundant coarse woody debris. Sub-stand characteristics were evaluated for 26 lynx dens from 1999 to 2004 in northwest Maine (J. Organ, USFWS, unpubl. data). Dens were found in several stand types. Modeling of den site variables determined that tip-up mounds (exposed roots from fallen trees) alone best explained den site selection (J. Organ, unpubl. data). Tip-up mounds may purely be an index of downed tress, which were abundant on the landscape. Horizontal cover at 5 m (16 ft) alone was the next best performing model (J. Organ, unpubl. data). Dead downed trees were sampled, but did not explain den site selection as well as tip-up mounds and cover at 5 meters. Lynx essentially select den sites in dense cover. Natural and anthropomorphic influences within the lynx’s range in Maine provide an abundance of lynx denning habitat.

There is little information about how Maine lynx are affected by low traffic volume, gravel logging roads. Home ranges of all lynx radio-tagged in the Clayton Lake area, Maine include a variety of sizes of forest roads from frequently-traveled haul roads to seasonal skid trail (MDIFW, unpub. data). Road density in the lynx study area (containing some of Maine's best quality lynx habitat) is over 1 km of road/km^2. High road density is often indicative of an intensively logged area. Hoving (2001) did not find that logging road density was a significant determinant influencing lynx distribution in the Northeast region. Fuller (2006) found Maine lynx used areas within 30 m of roads less than their availability. On the other hand, tracking of radio-tagged lynx, winter snow tracking surveys, and anecdotal observation of lynx in Maine documented that lynx routinely cross logging roads and use them for traveling. Radio-tagged lynx from Clayton Lake, Maine traveled hundreds of km to the Gaspe Peninsula, New Brunswick, and southern Quebec, and had to cross many roads. Logging roads did not seem to affect lynx habitat use in lightly roaded areas in northcentral Washington (McKelvey et al. 2000d).

Lynx road mortality recorded in Maine has been confirmed by MDIFW by collecting lynx carcasses with obvious injuries received from collision with a vehicle. Since 2000, lynx road mortality has occurred on logging roads (n=9) and paved public roads (n=2)(MDIFW unpub. data). Most logging road mortality occurred on two-lane haul roads where higher traffic volume (up to 300 vehicles/day) and speed (45-50 mph) would occur. These roads are open to the public, and public traffic volume exceeds forestry-related traffic by several-fold.

The density and distribution of logging roads greatly influence recreational use of the landscape by humans and may have secondary effects on lynx. Trapping, hunting, and other potential sources of human-related mortality are indirectly influenced by logging roads. However, at this time, there is no compelling evidence to suggest that forest roads or their secondary impacts limit lynx populations (Ruediger et al. 2000).

In Maine, lynx have not been documented in moderately to heavily developed areas on the fringe of their range (i.e. Greenville, Millinocket). A radio-tagged lynx in Maine established a home range in undeveloped, corporate forest land adjacent to the town of Ashland, but did not use the developed portions of the town (MDIFW, unpub. data). Similarly, Maine lynx roaming out of their home ranges have approached moderately-settled areas, but returned to their home ranges (MDIFW, unpub. data).

Lynx Habitat Requirements in Maine

Lynx populations respond to biotic and abiotic factors at different scales. At the regional scale, snow conditions, boreal forest and competitors (especially bobcat) influence the species' range (Aubry et al. 2000; McKelvey et al. 2000b; Hoving et al. 2005). At the landscape scale, natural and human-caused disturbance processes (e.g., fire, wind, insect infestations and forest management) influence the spatial and temporal distribution of lynx populations by influencing the amount and distribution of high quality snowshoe hare habitat (Agee 2000; Ruediger et al. 2000). Within Maine, snowshoe hare density and the presence of bobcats most influenced lynx geographic distribution (Robinson 2006). At the stand-level scale, quality (hare density), quantity, and juxtaposition of habitats influence home range size, productivity, and survival (Aubry et al 2000, Vashon et al. 2005a, Robinson 2006). At the substand scale, spatial distribution and abundance of prey and microclimate influence movements, hunting behavior, den, and resting site locations (Fuller 2006).

At a regional scale (northeastern United States and eastern Canada) Hoving et al. (2005) documented that Canada lynx distribution was strongly associated with areas of deep snowfall and 100 km^2 landscapes comprised of little deciduous forest. Hoving et al. (2005) concluded that the broad geographic distribution of lynx in eastern North America is most influenced by snowfall, but within areas of similarly deep snowfall, measures of forest succession are important.

At a smaller (northwestern Maine) scale, Hoving et al. (2004) and Robinson (2006) compared landscape attributes of areas where lynx had been detected on snow track surveys to where lynx had not been detected. Logistic regression models predicted lynx were more likely to occur in 100 km^2 landscapes with abundant late regenerating forest, and less likely to occur in landscapes with much recent clearcut, partial harvest, forested wetland, and deciduous forest. Hoving described "late regeneration" forest as clearcut >10 years prior and having >50% overhead closure at a height of 1 meter. Lynx were not associated positively or negatively with mature coniferous forest. Lynx were associated with young forests more than mature forests, however old growth forests were functionally absent from the landscape. The Hoving et al (2004) model predicted that potential habitat for lynx in northern Maine in the early-1990s was rare, patchily distributed, and comprised 6% of the landscape (546 km^2 or 134,916 acres with a >50% probability of supporting lynx). Lynx were positively associated with 100 km^2 landscapes altered by clearcutting 15-30 years previously. The proportion of mature conifer forest in the landscape was not a powerful determinant of lynx occurrence, and the influence of mature deciduous forest on lynx occurrence was ambiguous. Lynx snow track surveys completed from 2003 to 2006 documented that lynx were widely distributed throughout northern Maine with habitat occurring across north-central Maine.

In a more recent evaluation of lynx habitat, Robinson (2006) used lynx snow tracking surveys (2002-2005) to model lynx habitat at the geographic (within the state of Maine) and home range scales (within the range of lynx in Maine). A snowshoe hare habitat model was developed to derive landscape hare densities across the lynx range. The best model of lynx habitat at the geographic scale included landscape hare density (+) and presence of bobcats (-). At the home range scale, landscape hare density best described lynx presence vs. absence. Landscape hare density is correlated with regenerating clearcuts (average 2.0 hares/ha).

A preliminary analysis of the habitat use of 17 radio-tagged lynx in 2002 in the Clayton Lake region in northwestern Maine compared habitat use vs. availability within the surrounding landscape, within the home range, and core use areas within home ranges (Vashon et al. 2005a). Within their home range, lynx preferred mature softwood and mid-regenerating softwood dominated mixed stands. Lynx avoided early regenerating, pole, mature hardwood, hardwood dominated mixed stands and other non-forested habitat. Mid-regenerating stands comprised 85% of telemetry locations for females and 77% for males. Mid-regenerating stands in Clayton Lake were 3.4-6.1 meters in height and were created by clearcutting stands to salvage trees after the spruce budworm outbreak in the 1970s and 1980s. A more complete analysis is pending.

Fuller (2006) backtracked six radio-tagged lynx for 65 km (40 mi.) during two winters on the Clayton Lake study area to document winter habitat selection at the stand scale. She compared vegetation characteristics in areas used by lynx with random points located within lynx home ranges. She also analyzed habitat for sites where lynx killed hares. She documented that lynx selected older (11-26 year-old), tall (15-24 foot), mid-regenerating clearcut stands, and older (11-21 year-old) partially harvested stands. Lynx avoided young (<11 years) clearcut stands, short (11-14 foot) mid-regenerating clearcut stands, recent (1-10 years) partially harvested stands, and mature stands. Most of the stands were dominated by softwood (spruce and fir). Eighty-one percent of 16 hare kills were in short regenerating clearcut stands (n=5) and tall regenerating clearcut stands (n=8).

These studies indicate that lynx select softwood-dominated mid-regenerating clearcut stands with associated high hare densities at the landscape level, within their home ranges, within foraging and high use areas, and to locate their dens. Regenerating clearcut stands used by lynx generally develop 12-30 years after cutting and are characterized by dense horizontal structure and high stem density within a meter of the ground. These habitats support high snowshoe hare densities (average of 1.6 to 2.4 hares/ha)(Fuller 1999, Lachowski 1997, Homyack 2003, Vashon et al. 2005b, Robinson 2006). Lynx seem to use regenerating clearcut stands until about 30 years of age when the canopy closes, the stand begins to self-thin, and the understory is reduced, but it is unknown whether hare densities decline dramatically or gradually after a stand reaches this level of development. Maine lynx avoid recently clearcut and recent partially harvested areas, which lack the structure to support high hare densities. However, these stands may become used by lynx as they mature, especially if dense regenerating softwoods dominate the understory. Lynx selected older partially harvested stands (Fuller 2006) when they occurred in a matrix of regenerating clearcuts. Partial harvesting, the dominant form of silviculture in Maine today, supports moderate hare densities (0.2 to 1.6 hares/ha, Robinson 2006), which in many instances may be inadequate hare densities to support lynx.

Old growth forest does not currently exist as a functional component of Maine’s boreal forest. Thus the current research provides little information about positive or negative associations of Canada lynx with old growth forest. Older, multi-story, multi-age stands may develop adequate understory structure to support moderate snowshoe hare populations, especially if the canopy has been opened by wind-throw, insect damage, or selective or patch cuts. Mature stands may be also used as movement corridors or for hunting (esp. in summer)(Vashon et al. 2005a). Across northern Maine, older stands were not prevalent and were not a powerful determinant of lynx occurrence in landscape scale analyses (Hoving et al. 2005). At a regional scale, mature hardwood stands were negatively associated with lynx occurrence (Hoving et al. 2005).

Since studies began in 1995, Maine’s hare population has not shown evidence of 10-year population cycles. Hare density data collected at several locations in northern Maine since 1995 indicate a sustained high population of hares with little variation (Homyack 2003, D. Harrison and W. Krohn, UMaine, unpub. data). It is hypothesized that the lynx population is being sustained by unusually favorable habitat conditions for snowshoe hares in a forest regenerating from extensive clearcutting. In the early 2000s, lynx populations in the Gaspe region of Quebec were similarly high (Fortin and Tardif 2003). Recent satellite imagery analysis by The Nature Conservancy shows a preponderance of regenerating softwood forest in Maine, southern Quebec, New Brunswick, and Nova Scotia, which suggests that lynx could be increasing throughout the region (Ray et al. 2002, Carroll 2005). Up to 7% of the pre-settlement spruce-fir-northern hardwood forest in northern Maine was in the 1-15-year seedling-sapling age class created by wind-throw, fire, and insect epidemics (Lorimer and White 2003). Today, 20-30 years post-budworm, the amount of early successional habitat in northern Maine spruce-fir stands has increased from about 500,000 acres in 1982 to 1.75 million acres in 2003, or about 25% of the landscape (Trani et al. 2001). This large supply of young, regenerating softwood provides habitat benefits for lynx, moose, snowshoe hares, and other early successional species. By 2010-15, many of the budworm-era clearcuts will grow out of optimal habitat conditions for hares and lynx.

Following the last budworm outbreak (1972-1986) about 45% of the annual forest harvest (47,000 hectares) was by clearcut and 55% by partial harvest (Maine Forest Service 1995). In 1989, the Maine Forest Practices Act was enacted, which regulates the amount and size of clearcutting. By 1999, clearcuts accounted for only 3% of the annual harvest, whereas partial harvest methods (including shelterwood, seed tree, group selection, and others) accounted for 96% of the forest area harvested (Maine Forest Service 2000). Clearcutting remains a dominant forest practice in eastern Canada. Established partially harvested stands were selected by lynx in winter because they are less dense and provide easier access to hares (Fuller 2006). Hare densities in established partially harvested stands were 0.2-1.6 hares/ha (Robinson 2006), but in some instances may be positively influenced by adjacent regenerating clearcut stands. Until further information is obtained, it is not possible to determine how significant the shift from clearcutting to partial harvesting in Maine's will affect lynx.

Lynx mortality

The most commonly reported causes of lynx mortality include starvation of kittens (Quinn and Parker 1987; Koehler 1990) and human-caused mortality (Ward and Krebs 1985; Bailey et al. 1986). Significant lynx mortality due to starvation (up to two-thirds of deaths) has been demonstrated in cyclic populations of the northern taiga during the first 2 years of hare scarcity (Poole 1994; Slough and Mowat 1996). Where trapping of lynx occurs legally, mortality of adults may be almost entirely human-caused during hare population lows (Poole 1994). Lynx are also killed by automobiles, disease, and other mammal species, although the significance of these factors to lynx populations is uncertain (Brand and Keith 1979; Carbyn and Patriquin 1983; T. Shenk, *in litt.* 2004; Ward and Krebs 1985; Bailey et al. 1986). During a lynx irruption in Minnesota in 1971-1974, 96 percent of 128 mortalities were caused by trapping or shooting, whereas 4 percent were killed by cars (Henderson 1977). At that time trapping of lynx was legal in Minnesota, at least during a limited open season. Of the 21 lynx mortalities recorded in Minnesota since 2002, six died after being trapped, five died as a result of collisions with cars, four died of unknown causes, three were shot, two died after collisions with trains, and one was predated (Phil Delphey, USFWS, Twin Cities Field Office, unpub. data). Of the 37 lynx that have died of known or suspected causes in Colorado since the state began reintroducing the species in 1999, 13 (35 percent) died as a result of being shot or from other human causes (excluding vehicles), ten (27 percent) were killed by vehicles, nine (24 percent) starved, four (11 percent) died of plague, and 1 (3 percent) was predated (T. Shenk, *in litt.* 2004). In contrast with established population, introduced lynx may be more susceptible to road mortality because of their tendency to disperse or wander from the release site. During an unsuccessful attempt to reintroduce lynx to the Adirondack Mountains of New York, 18 of 37 mortalities of translocated animals were attributed to road kills (Brocke et al. 1990).

Maine Inland Fisheries and Wildlife (MDIFW)(Wally Jakubas, MDIFW, unpub. data) reported the following mortality since 1999:

Lynx mortalities associated with radio-telemetry study.

Cause of mortality	**Number of mortalities**	**Proportion of total mortalities**	**Sex ration of lynx that died**
Starvation	11	36%	7M:4F
Predation	5	16%	5F
Disease	1	3%	1M
Illegal harvest	3	7%	2F, 1?
Canada harvest	3	10%	2M, 1F, 1?
Unknown	9[A]	29%	2M,7F
Total	33		12M, 19F, 2?

[A]Five of 9 unknown causes of mortality are suspected to be predation, but could not be unequivocally confirmed as being caused by predation. The major cause of predation seems to be fishers.

Chronology of Canada lynx carcasses recovered on roads in northern Maine from 1999-2006. In all instances the carcasses and nature of injury strongly suggested collision with a vehicle.

Date	Number of lynx killed by vehicles	Comments
1999	0	
2000	1	West Cottage Road, Portage
2001	0	

2002	1	Robichaud Road, T17 R13 WELS
2003	1	Realty Road (Mi. 51), T11 R12 WELS
2004	3	Beaver Brook Road (near intersection with Rt. 11), Nashville Plt. Rocky Brook Road (Mi. 21.5) T13 R9 WELS Irving/Estcourt Road, T16 R13 WELS
2005	3	Wilderness Island Road, T14 R7 WELS Beaver Brook Road (~4 mi. E. of Rt. 11), T13 R5 Jack Mountain Road (Mi. 14-15), T10 R9 WELS * in addition one radio-tagged Maine lynx was killed on a highway in Quebec
2006	2	Rt. 161 (near Madawaska L.), T16 R4 WELS Wilderness Island Road (Mi. 8), T14 R8 WELS
Total	11	

In addition to the above, one illegal shooting of a lynx was prosecuted in 2006. There are several additional cases of illegal take of lynx that are currently under investigation. Increasing public awareness or actual population increases may attribute for the increased road mortality in recent years.

Status of the bald eagle

There are no nesting bald eagles (*Haliaeetus leucocephalus*) in the project area, although they could nest along Cross Lake in the future. The only bald eagle activity near the site would be an occasional, transient bald eagle.

Level of authorized take

There are no previous biological opinions for federal actions authorizing take of Canada lynx in Maine. MDIFW is preparing an incidental take plan for a Section 10(a)(1)(b) permit to authorize the incidental take of lynx by recreational trappers during the trapping season. In 2007, the Service completed a programmatic biological opinion for the Canada lynx, bald eagle, and gray wolf for the Healthy Forest Reserve Program. This program is anticipated to have beneficial effects to all species, especially lynx, although some take make be enumerated in subsequent associated biological opinions. The anticipated level of take from this plan is yet to be determined (as are any potential benefits from mitigation measures).

3. Analysis of the Species Likely to be Affected

As stated above, MaineDOT and the Service concluded during informal consultation that the proposed action may affect and is likely to adversely affect Canada lynx. Subsequently, MaineDOT, FHWA, and the Service concluded that the proposed action may affect and is likely to adversely affect Canada lynx. They also concluded that critical habitat would not be affected (because there was no critical habitat designated in Maine). The Service concurred with these determinations.

4. Environmental Baseline

Regulations implementing the Act (50 CFR §402.02) define the environmental baseline as the past and present impacts of all Federal, State, or private actions and other human activities in the action area. Also included in the environmental baseline are the anticipated impacts of all proposed Federal projects in the action area which have already undergone section 7 consultation, and the impacts of state and private actions which are contemporaneous with the consultations in progress. Such actions include, but are not limited to, previous timber harvests and other land management activities. The action area includes a 5.23 mile section of Route 161FR 424 and its right-of-way. Unlike new logging roads or access roads for developments, this highway upgrade is not expected to cause any secondary effects to lynx (e.g. increased risk to trapping, increased snowmobile access).

4.1. Status of the Species in the Action Area

4.1.1. Canada lynx

In February, 2006, a female lynx was struck and killed while crossing Route 161 approximately 8 miles south of the action area near Madawaska Lake in T16 R4 WELS. In September of 2006, an additional lynx mortality occurred on a logging road in the same area (likely not a road mortality and is under investigation). These occurrences suggest lynx are active and moving across roads in the vicinity of the project area. Habitat models (Robinson 2006) identify a large patch of high quality lynx habitat in the town of Westmanland that are predicted to support hare densities of 2.0 hares/ha or greater. Since lynx occurrence is highly correlated with hare densities, and since there have been sightings of lynx, a radio-tagged lynx, and road mortality in the area (MDIFW, unpub. data), it can be assumed that there is lynx activity in the vicinity of the project.

4.2. Factors Affecting Species in the Action Area

Vehicle traffic on Route 161, nearby logging roads, and private roads may affect Canada lynx in the action area. As stated above, annual average daily traffic in this portion of Route 161 is 1540 vehicle per day. The anticipated increase in road usage is unlikely to affect traffic on adjacent roads and highways. Current posted traffic speeds on Route 161 is 50 miles per hour. The forecasted increase in road usage is minimal and will not affect traffic on adjacent roads and highways

Conifer forest habitat suitable for both lynx lies immediately adjacent to Route 161 for about 3.7 of the 5.2 mi. project action area. The presence of a utility line corridor is not likely wide enough to prevent lynx from crossing the road. Private landowners are the predominant landowners in or near the action area, and there are numerous driveways off the west side of Route 161 leading to camps along Cross Lake. Cross Lake and associated heavy camp development likely serves as a barrier to lynx movement. Lynx moving through the area would be funneled around the north or south end of Cross Lake. Even in the winter, it is unlikely that lynx would cross an open expanse of frozen lake when forested habitat is available as a travel corridor at either end of the lake. Large agricultural fields exist north of the action area that also would serve as a barrier to lynx movements. The area of greatest likelihood of a lynx crossing Route 161 in the project area is between Dickey Brook and the large agricultural fields and the north end of the action area.

4.2.1. Canada lynx and roads

Human-related causes were confirmed for 3 of 33 lynx mortalities on the Maine lynx study area near Clayton Lake. Automobiles caused 11 documented lynx mortalities since 1999. Nine mortalities occurred on two-lane logging haul roads that are open to the public and frequently used by non-logging traffic. Two were killed on paved roads – one a low-traffic municipal road in Portage, and the other on Route 161 south of the action area. Additional road mortalities may have likely occurred but gone undetected. A lynx illegally killed was found on a logging road in 2006 near the action area.

In an ongoing study of radio- and GPS-collared lynx in Minnesota, 1 of 11 lynx killed was killed on a road. Four additional lynx deaths have been confirmed in Minnesota because of collisions with vehicles on roads since the species was listed as threatened in 2000 (USFWS, Twin Cities Field Office, Bloomington, MN, unpubl. data). These deaths have occurred on a wide variety of roads with average daily traffic volume ranging from 19 to 19,400 vehicles per day (USFWS, Twin Cities Field Office, Bloomington, MN, unpubl. data).

In Colorado nine lynx deaths due to vehicle collisions have been recorded since 1999 (two other lynx from Colorado were killed in adjacent states, K. Broderdorp et al., USFWS, *in litt.* 2006). Animals recently reintroduced may have a propensity to roam, thus increasing risk to road mortality. As in Minnesota, estimated traffic volumes vary widely among roadkill locations, from 480 to 27,600 vehicles per day.

Lynx populations characteristically fluctuate during approximately 10-year cycles in response to changes in numbers of their primary prey, snowshoe hare. However, there is no evidence that hare cycles occur in Maine. Hare numbers seems to have stayed consistently high in areas of large clearcuts used in the 1970s and 1980s to salvage timber damaged by the spruce budworm (D. Harrison, Univ. of Maine, unpub. data). Hare habitat is in prime condition in areas having large patches of regenerating clearcuts. Hare densities are expected to fluctuate, but remain high in these areas for another 10 years. New habitat may be created for hares and lynx wherever logging creates large patches of dense, regenerating conifer. Much of the landscape surrounding Route 161 is actively-managed industrial forest land. Thus, lynx we would expect lynx to be present in or near the action area for many years. Lynx regularly disperse from their natal or home range areas and can travel for 100s of kilometers distant. The action area lies between large areas of high quality lynx habitat in northwestern Maine and northwestern New Brunswick. Radio-tagged lynx from Maine have made movements into New Brunswick as lynx from Canada undoubtedly disperse into Maine. The Cross Lake area may be an important corridor for lynx movements. In addition to resident lynx, long-distance dispersing animals may move through the area and cross Route 161. No studies have been done by MaineDOT to document lynx road crossing in the action area.

5. Effects of the Proposed Action

Effects of the action are defined as "the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with the actions, that will be added to the environmental baseline" (50 CFR §402.02). Direct effects are defined as the direct or immediate effects of the action on the species or its habitat. Direct effects result from the agency action, including the effects of interrelated and interdependent actions. Indirect effects are caused by or result from the agency action, are later in time, and are reasonably certain to occur. Indirect effects may occur outside of the immediate footprint of the project area, but would occur within the action area as defined.

5.1. Direct and Indirect Effects

Construction-related effects on Canada lynx are expected to be insignificant. Construction equipment will be operating within an already cleared right-of-way. To meet the terms and conditions of the opinion, some widening of the cleared buffer will be done by removing forest vegetation, which will be < 1 acre total in cleared vegetation. This is an insignificant, discountable impact on lynx habitat. Periodic mowing or herbiciding of the right-of-way is a required condition of this opinion, but will have insignificant effects on lynx.

Lynx are susceptible to being killed on roads. Since 1999, biologists have documented 11 road-killed lynx in Maine. These lynx were reported by motorists and investigated by MDIFW biologists or wardens. Nine of 11 lynx were killed on gravel roads in undeveloped areas of the state with a fraction of the traffic volume (100-300 vehicles/day?) of Route 161 and at lower design traffic speeds (45-50 mph). The close proximity of good quality habitat, nearby documented lynx occurrence records, and lynx mortality on Route 161 south of the project area indicate that there is a risk of lynx being killed on this road. The expected increase in traffic speed and traffic volume because of this project will raise the risk.

We are unaware of studies from which to base an estimate of the quantitative impact of roads on lynx. Radio-telemetry studies of lynx in roaded, rural areas of Minnesota may provide information in the future. Numerous assumptions will have to be made to estimate the number of lynx that would likely be hit by vehicles as a result of reconstructing 5.23 miles of Route 161. We do have studies to base estimates of road mortality on wolves in Wisconsin. For purposes of this biological opinion, we will assume that lynx are equally susceptible to being killed by vehicles as are wolves and will use wolf data as a surrogate for lynx. The Service employed this methodology to estimate incidental take of lynx for a biological opinion on a highway project in Minnesota (Phil Delphey. 2006. Biological Opinion for Forest Road 424 (Denley Road) Reconstruction, Lake and St. Louis Counties, Minnesota, Twin Cities Field Office, Bloomington, MN).

Kohn et al. (2000) documented the precise locations of 37 wolf crossings of U.S. Highway 53 in Wisconsin and found that 81 percent of those crossings were made by dispersing wolves vs. crossing as packs. Traffic volume on U.S. Highway 53 (4700 vehicles/day) was approximately 3 times the current traffic volume on Route 161 (1,540 vehicles/day). In their study wolves were most likely to cross the highway where visibility was relatively high – for example, where there was relatively little shrub cover at eye level – and where adjacent habitat was unfragmented by human-related disturbances, such as buildings, logging, and gravel pits (Frair 1999). Mean road width at 19 wolf crossing locations on Wisconsin Highway 35 was 14.36 m (~43 feet) and was significantly wider than at randomly measured locations (Frair 1999).

Habitat conditions in the Wisconsin wolf study were comparable to northern Maine. The Wisconsin study took place in a 7000 km^2 area in northwestern Wisconsin, which abuts the Minnesota border. The area was described by Kohn et al. (2000) as fairly undeveloped. Road densities within the study area ranged from 0-1.5 km/km^2 and most of the land was in county, state, or industrial forest land ownership. Topography was gently to strongly rolling hills and the forest was composed primarily of sugar maple, basswood, aspen, paper birch, northern red oak, jack pine, red pine. Lowland areas and bogs were dominated by sedges, black spruce, white cedar and tamarack. Wolves preferred to cross the highway in association with these lowland habitats.

Because of the increased traffic speed and volume, this project will add a measurable increment of lynx mortality to the existing condition. To estimate the post-construction frequency of lynx deaths due to automobile collisions on Route 161 we make the following assumptions:

1. Maine lynx have a similar road mortality rate as wolves studied in Wisconsin.
2. The probability of death due to automobile collision is proportional to traffic volume and lynx density;
3. Post-construction traffic volume on Route 161 will be 1,540 vehicles/day and increase slightly to 1850 vehicles /day by 2026 (information provided by MaineDOT).
4. Traffic speeds will increase to 55 mph on Route 161 (information provided by MaineDOT) and approximate traffic speeds on Highway 53 in the Wisconsin wolf study;
5. Wolf densities in the Wisconsin study area, where wolves were becoming reestablished during the study, were about 0.006 wolves/100 km^2. Lynx density in the Rt. 161 study area is 0.075 lynx/km^2 in Maine (half the lynx density observed by on the Maine Musquacook Lake study area)(Jen Vashon, MDIFW, unpub. data). Lynx densities remain the same during the next 15 years.

Data are insufficient to estimate lynx density in the vicinity of Route 161. We assumed lynx density in the vicinity of Route 161 was half that documented in Maine's Musquacook Lakes area, (15 lynx/100km^2 or 0.15 lynx/sq. km^2) (MDIFW unpub. data). Lynx densities in Maine are similar to those found in the taiga (the core of lynx range) during times of hare abundance (i.e., 30-45 lynx/100 km^2 Slough and Mowat 1996; 8-20 lynx/100 km^2 Parker et al. 1983, Banville 1986, Kesterson 1988, Noiseux and Doucet 1987, Fortin and Huot 1995; O'Donaghue et al. 1997). Population densities during the low in a hare cycle are typically less than 3 lynx/100km^2, regardless of habitat quality (Brand et al. 1976, Poole 1994, Staples 1995, Slough and Mowatt 1996; O'Donaghue et al. 1997). Lynx densities in Washington were 2-2.6 lynx/100km^2 during a 7-year study period (Aubry et al. 2000).

To estimate the number and frequency of wolf-vehicle collisions as a result of the paving and reconstruction of FR 424, we used the results of the Wisconsin study referred to above (Kohn et al. 2000). In that study three wolves were confirmed dead from automobile collisions in a 44-mile length of U.S. Highway 53 during a seven-year study period – i.e., approximately 0.01 wolves/mile/year. Even intensive studies, such as this one, are unlikely to document all road-related mortality, and the proportion documented is typically unknown (Clarke et al. 1998). In the Wisconsin study (Kohn et al. 2000), the likelihood of detecting wolf-automobile collisions during the winter was probably very high because a biologist drove the road every day looking for signs of wolves crossing the road, but detection likelihood was probably low during the summer (E. Anderson, University of Wisconsin – Stevens Point, pers. comm. 11/29/06). The low incidence of road-kill and the study design does not allow for an estimate of the proportion of road-kill detected. We will assume that Kohn et al. (2000) documented 50-100% of the wolf mortalities due to automobile collision on Highway 53 during their study – i.e., that actual mortality was 0.01-0.02 wolves/mile/year.

Traffic volume on Highway 53 was 4700 vehicles/day (Kohn et al. 2000), whereas current traffic volume on Route 161 is about 1,540 vehicles/day. To estimate the post-construction frequency of lynx deaths due to automobile collisions on Route 161 we used the following calculation:

$$0.01 \text{ wolves killed/mile/year} \times \frac{1{,}540 \text{ vehicles/day (Rt. 161)}}{4{,}700 \text{ vehicles/day (Hwy. 53)}} \times \frac{0.075 \text{ lynx/km}^2}{0.006 \text{ wolves/km}^2} \times 5.23 \text{ mi.}$$

$$0.02 \text{ wolves killed/mile/year} \times \frac{1{,}540 \text{ vehicles/day (Rt. 161)}}{4{,}700 \text{ vehicles/day (Hwy. 53)}} \times \frac{0.075 \text{ lynx/km}^2}{0.006 \text{ wolves/km}^2} \times 5.23 \text{ mi.}$$

Based on the above assumptions regarding traffic volume, susceptibility to vehicle collisions, traffic speeds, lynx densities, and current likelihood of vehicle collisions, we estimate that the proposed action would result in approximately 0.21 to 0.43 road-killed lynx/year – about one every 3 to 5 years. The collision rate may increase by 20% to 0.25 to 0.52 road-killed lynx/year – about one every 2 to 4 years – assuming MAINEDOT traffic projections of 1,850 vehicles/day by 2026.

Since we assume that road mortality varies directly with lynx densities, if habitat conditions (and lynx numbers) decline, so will mortalities (unless increased dispersal occurs during the time when populations and habitat are equilibrating). Similarly, if habitat conditions within the action area improve for lynx, road mortality could increase. We believe the take of one lynx every 3 to 5 years to vehicle collision represents a biologically-reasonable estimate of take. If habitat improves or populations increase in or near the action area and take exceeds this amount, then we will reinitiate consultation.

The loss of one lynx every 3 to 5 years to vehicle collision in the project area would have relatively minimal impacts on the population of lynx in Maine. This would represent the loss of less than 0.01 percent of the lynx population in the northwestern Maine (roughly estimated to be 500 animals). In a worst-case scenario, a female with dependent kittens could be killed, resulting in the potential loss of a litter of kittens in addition to the adult. Mean litter size in northwestern Maine may be about two kittens (MDIFW unpub. data). Therefore, the proposed action could result in a 0.03 percent decrease in the Maine lynx population, once every 3 to 5 years. This is unlikely to result in any appreciable effects on the survival of lynx in Maine.

5.2. Effects of Interrelated or Interdependent Actions

Interrelated actions are those that are a part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. We do not believe this project will increase development in or near the project area. We can think of no actions that would have effects on the Canada lynx that have not already been addressed in the previous section.

5.3. Cumulative Effects

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this Opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. For instance, the MaineDOT plans to do addition improvements to Route 161 adjacent to the project area. We cannot think of other cumulative state, tribal, local, or private actions that will be precipitated by this project. Road improvements are not expected to increase development of the area. The anticipated increase in road usage is minimal and will not affect traffic on adjacent roads and highways. All other future actions that are reasonably certain to occur in the action area and that may affect lynx will likely have some federal component that will require section 7 consultation. These include additional road improvements made to Route 161.

6. Conclusion

After reviewing the current status of the Canada lynx, the environmental baseline for the action area, the effects of the proposed Route 161 reconstruction and the cumulative effects, it is the Service's Opinion that the action, as proposed, is not likely to jeopardize the continued existence of the Contiguous United States Distinct Population of Canada lynx and will not destroy or adversely modify designated critical habitat for Canada lynx.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by the FHWA and MaineDOT so that they become binding conditions of any grant or permit issued to any applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The FHWA has a continuing duty to regulate the activity covered by the incidental take statement. If the FHWA (1) fails to assume and implement the terms and conditions or (2) fails to require any applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the FHWA must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement. [50 CFR §402.14(i)(3)].

1. Amount or Extent of Take Anticipated

In this biological opinion, we described the anticipated incidental take in terms of one Canada lynx killed by a vehicle as frequently as every 3 years, or 3 lynx every 9 years, on the 5.23 miles of Route 161 to be reconstructed. Incidental take for this project is defined as a lynx found dead on, or adjacent to, the highway that by visual inspection, or in subsequent necropsy, is documented to have lethal injuries indicative of a vehicle collision.

2. Effect of the Take

In the attached biological opinion, we concluded that the anticipated incidental take would not jeopardize the continued existence of the Contiguous United States Distinct Population Segment of Canada Lynx.

3. Reasonable and Prudent Measures

The Service believes the following reasonable and prudent measures (RPM) are necessary and appropriate to minimize take of Canada lynx:

Implement measures to reduce the likelihood of vehicle collisions with lynx on Route 161.

4. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the FHWA must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

RPM: Implement measures to reduce the likelihood of vehicle collisions with lynx on Route 161.

Term and Condition #1: Expanses of open, grass or low shrub (< 18 inches) vegetation may cause lynx to hesitate crossings a highway and increase driver visibility of wildlife, including lynx, approaching the highway. Local topography, the adjacency of Cross Lake (a barrier to movement), and habitat conditions in the project area suggest the highest probability of lynx crossing would occur in the 0.75 mile area of conifer forested area between Dickey Brook and agricultural fields at the northern portion of the project area. To minimize impacts of the road on lynx, as well as moose and other wildlife, the right-of-way will be cleared from the existing edge (which is approximately 33 feet from the center line of the road) to approximately 50 feet from the center line of the road. This will allow for increased visibility for both wildlife and motorists in this 0.75 mile portion of the highway. This additional clearing will lead to a widening of the area cleared of woody vegetation by about 18 feet on either side or the road along this section of the project.

Term and Condition #2: This 50 foot cleared right-of-way on the 0.75 mile area between Dickey Brook and agricultural fields will be maintained in a grass/shrub condition by annual mowing or herbicide use. If kept as shrubs, they will not be allowed to grow >18 inches tall.

The Service believes that no more than one Canada lynx will be killed by a vehicle as frequently as every 3 years, or 3 every 9 years, as a result of the proposed action. The reasonable and prudent measure, with its implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Federal agency must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

5. Reporting Requirements

5.1. If MaineDOT is informed of or discovers a Canada lynx killed on the road, the incident must be reported within 24 hours to U.S. Fish and Wildlife Service, Maine Field Office, Old Town, Maine (207 827-5938). These reports shall include all known information regarding the incident, including the date of incident, fate of the animal (e.g., dead), location of the carcass, geographic coordinates of the accident location, sex of the animal, and approximate age (i.e., adult, juvenile, yearling).

5.2. MaineDOT will train Maintenance and Operation staff to identify lynx and bobcats and encourage staff to document road mortality of both species in northern Maine while conducting normal operations. MaineDOT will establish a simple reporting procedure to investigate and document lynx or bobcat road-kill incidents on roads in northern Maine, particularly on Route 161. Whenever feasible, carcasses of lynx or bobcats will be collected, placed in a plastic bag and delivered to MDIFW or the USFW S. MaineDOT will develop and provide a description of this training process to USFWS, Maine Field Office, within 60 days of the receipt of this biological opinion. Data recorded and maintained for each incident shall include, at a minimum, the information required under requirement 5.1. The Service will review and approve the plan within 30 days of receiving the plan.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act, directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation Recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery programs, or to develop information.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their or their habitats, the Service requests notification of the implementation of any conservation recommendations.

- Study the effectiveness of any measures implemented as part of this action to limit automobile collisions with lynx (e.g., measures described above in Terms and Conditions).

- Conduct studies to determine frequency and location of lynx crossing highways. This could easily be done by daily monitoring and mapping lynx tracks along portions of highways after winter snows. These data could be used to refine incidental take calculations. Long-term studies may detect lynx road-kill mortalities, which would provide a data set similar to that for Wisconsin wolves.
- Evaluate the effectiveness of wildlife crossing signs to minimize mortality of lynx and other wildlife.
- If highly used crossing areas for lynx are identified, we recommend the construction of crossings (e.g., underpasses) to prevent them from crossing the reconstructed/paved road segment in those areas. Such underpasses often have fencing to guide animals to crossing structures. Some carnivores climb over (e.g., cougars, *Puma concolor*) or under (coyote, *Canis latrans*) some road mitigation fencing (Clevenger et al. 2001). Thus, fencing should be constructed that would ensure that lynx would not climb under or over it – Parks Canada buried a fence along the Trans Canada Highway to prevent access to carnivores (Clevenger et al. 2001). Extensions at a right angle to the fence may deter climbing. Crossings may most effectively reduce mortality if they are placed at the end of any fencing, where wildlife-automobile collisions may be clustered in the absence of crossings at those locations. Note that fencing and underpasses are not yet proven methods of reducing automobile collisions with lynx. In addition, lynx in Alberta "used underpasses infrequently" and instead traveled up to 9 km to cross the Trans Canada Highway in unfenced section (Gibeau and Heuer 1996 *cited in* Cain et al. 2003). Maximizing height of underpasses and other factors might increase use of underpasses by lynx (Clevenger and Waltho 2000).
- Continue to look for opportunities to close roads to reduce the likelihood of wildlife mortality that might be directly or indirectly related to the roads. One Minnesota lynx was killed on a forest road with measured average daily traffic of only 19 vehicles/day. Therefore, closure of even lightly used roads in some areas could reduce lynx mortality.

REINITIATION – CLOSING STATEMENT

This concludes formal consultation for the potential effects of the Route 161 reconstruction on the Contiguous United States Distinct Population Segment of Canada Lynx. As provided in 50 CFR §402.16. Reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this Opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this Opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Biological Opinion Approval

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Mark McCollough, Acting Project Leader, Maine Field Office
U. S. Fish and Wildlife Service

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